Software Process Improvement at GSFC

How Can We Help You?

12/17/04

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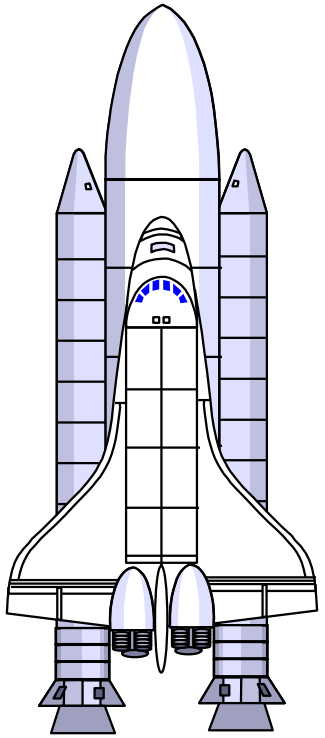
Agenda

How can we help you?

- What is available NOW
  - Process Documentation
  - Progress Tracking Mentoring/Tools
  - Tools
  - NPR Information



- What is "In the Works" (Partial availability)
  - Training
  - Lessons Learned Support
  - Peer Review Support

- What is planned early in the New Year
  - Metrics Collection and Analysis Support
  - General Information Sessions
  - Improved Key Templates (Product Plan, Status Reports)

Available- NOW Process Documentation

Although we are very early in our documentation process, many key items are available:

- **Document Templates**: FSW Product Plan Template, FSW Test Plan Template, CM Plan Template, VDD Template
- **Review Checklists**: SRR, PDR, CDR, and software contents for mission-level reviews
- **Software portions of RFP's** (request access)
- **Process Descriptions:** Project Planning, Risk Identification, Risk Monitoring, Project Monitoring and Control, Configuration Management

To find these assets, go to: http://software.gsfc.nasa.gov

And choose "Process Asset Library"

Process Assets Library (PAL)

PAL Contents:

Asset Categories:

Welcome to the GSFC Process Assets Library

The Process Assets Library (PAL) is the repository for all process assets that have been approved for software development at GSFC. PAL assets include policy statements, process and procedure descriptions, document templates, guidelines, standards, checklists, and tools. They are organized under the broad categories of project management, product development, and organizational support.

Assets are continually being added to the PAL. The initial set of assets has been developed by and for the Information Systems Division (ISD). Ultimately, however, this set will be augmented to serve all GSFC software projects.

PAL assets may be accessed in multiple ways. The following table shows how these access routes, or ñviews,ï can help you find the assets you need.

View	What the view provides
All Approved	All assets approved by the ISD Configuration Control Board. These assets are available in MS Office, PDF, and/or HTML format.
Index	A sortable index into the PAL Use this view to search for particular assets. You may select an asset category or enter words/character strings that you would expect to find in asset titles.
Project Management	All assets related to the initial planning, on-going management, and completion activities for a software development project.
Product Development	All assets related to technical activities for product development; ranging from initial system engineering to sustaining engineering / maintenance.
Organizational Support	All assets related to cross-cutting project activities such as configuration management and to organization-level activities such as training and

Index of Process Assets

This page provides an index into the Process Assets Library. To search for a particular asset, you may select a category of assets of interest, or enter words or character strings that you would expect to find in asset titles. Leaving the search string as "all" or clearing the entry box will allow you to see the entire list of process assets in the selected category. The "Find Assets" button is used to apply your selections and re-sort the list. Click on any column title/header to sort the list in ascending order by that columnís values.

Assets which are listed with a ⃠ in the Status column, are only available through use of Username and Password. To apply for access to this area, please complete and submit this form.

Select by Category All Categories

Find Assets **Apply Index Selections**

List only assets with title containing: all

Asset Number	Title	Owner	Asset Type	Status (More Info)	MS Office	PDF
1.0.0.1	ISD Software Policies	580	Policy	CCB approved		
1.1	Project Formulation	580	Process	Outline		
1.2	ISD Project Planning Process	580	Process	CCB approved		
1.2.1	Developing Software Estimates	580	Sub-process	Draft		
1.2.1.2	Wide-band Delphi Procedure	580	Procedure	CCB approved		
1.2.2.1	Guidelines for Selecting & Tailoring a Life Cycle	580	Guideline	Draft		
1.2.2.1.1	FSW In-house Life-Cycle	582	Guideline	CCB approved		
1.2.2.1.2	FSW/GNC Business Model	582	Sub-process	Outline		
1.2.3	ISD Software Risk Identification	580	Sub-process	CCB approved		

ISD Checklist

Number: 580-CK-006-01
Effective Date: 04/01/2004
Expiration Date: 04/01/2005

Approved By: (signature)
Name: Joe Hennessy
Title: Chief, ISD

Asset Owner: GSFC Engineering Process Group
Title: Software Contents of the Mission-Level PDR

Asset Type: Checklist
PAL Number: 2.3.1.5

Software Contents of the Mission-Level Preliminary Design Review (PDR)

Use this checklist to ensure that key elements of the software preliminary design, management process, and status are presented for review as part of the System (Mission-Level) PDR. Structure the presentation at a high level so that this material can be covered in about 1 hour.

- ❑ **Software-related Requests for Action (RFAs) and responses** from the Code 300 System Concept Review (SCR) or System Requirements Review (SRR)
- ❑ **Requirements summary** – High-level review and update of software requirements
  - ❑ Overview of requirements documents
  - ❑ Requirements for reuse of existing software
  - ❑ Unique requirements
  - ❑ ICD status and key interface issues
  - ❑ Safety and security requirements
- ❑ **Operational scenarios**
  - ❑ Normal/nominal operations scenarios
  - ❑ Fault detection, isolation, and recovery (FDIR) strategy and scenarios
  - ❑ Safety hazard reduction strategies (if applicable)
- ❑ **High-level design** – At a minimum, include the following:
  - ❑ Software architecture, external interfaces and end-to-end data flow
  - ❑ Design drivers (e.g., performance, reliability, hardware considerations)
  - ❑ Analyses of design alternatives, including reuse and/or COTS tradeoffs
  - ❑ Results from Preliminary Hazard Analysis as it relates to software safety-critical elements (if applicable)
  - ❑ Block diagram of software architecture
  - ❑ Mapping of system-level and derived requirements to subsystems or CSCIs, highlighting safety-critical requirements
  - ❑ For each major component, the component's structure, functional allocations, and internal interfaces
  - ❑ Use Cases for the software system and subsystems
- ❑ **Software Management Plan (SMP)** – Review the following, highlighting changes or additions since SCR/SRR:
  - ❑ Organization/WBS/Project relationship
  - ❑ Software size estimates, budgets, and staffing
  - ❑ Development schedule showing key receivables, deliverables, and dependencies
  - ❑ Requirements management approach and tools
  - ❑ Development approach, including peer review/walkthrough plans
  - ❑ Documentation plan, including when documents are to be baselined
  - ❑ Build/release plan – contents and schedule
  - ❑ Software development and test environments and tools
  - ❑ Test strategy/plan, including test drivers/simulators and test data
  - ❑ Configuration Management, Product Assurance, and Software Safety plans and tools
  - ❑ IT Security strategy for development, integration & test, and operations
  - ❑ Risks and risk management plans
  - ❑ Infusion of previous Lessons Learned; collection of new Lessons Learned
- ❑ **Software status** – Current schedule, milestone, and cost/effort status
- ❑ **Issues, TBDs, and action items**

Category: **Acquisition**

Process: **Acquisition Planning**

Acquisition is...

The process of obtaining through contract; any discrete action or proposed action by the acquisition entity that would commit to invest (appropriated funds) for obtaining products and services. (Capability Maturity Model Integration [CMMI], Version 1.1)

Acquisition Planning is...

TBS

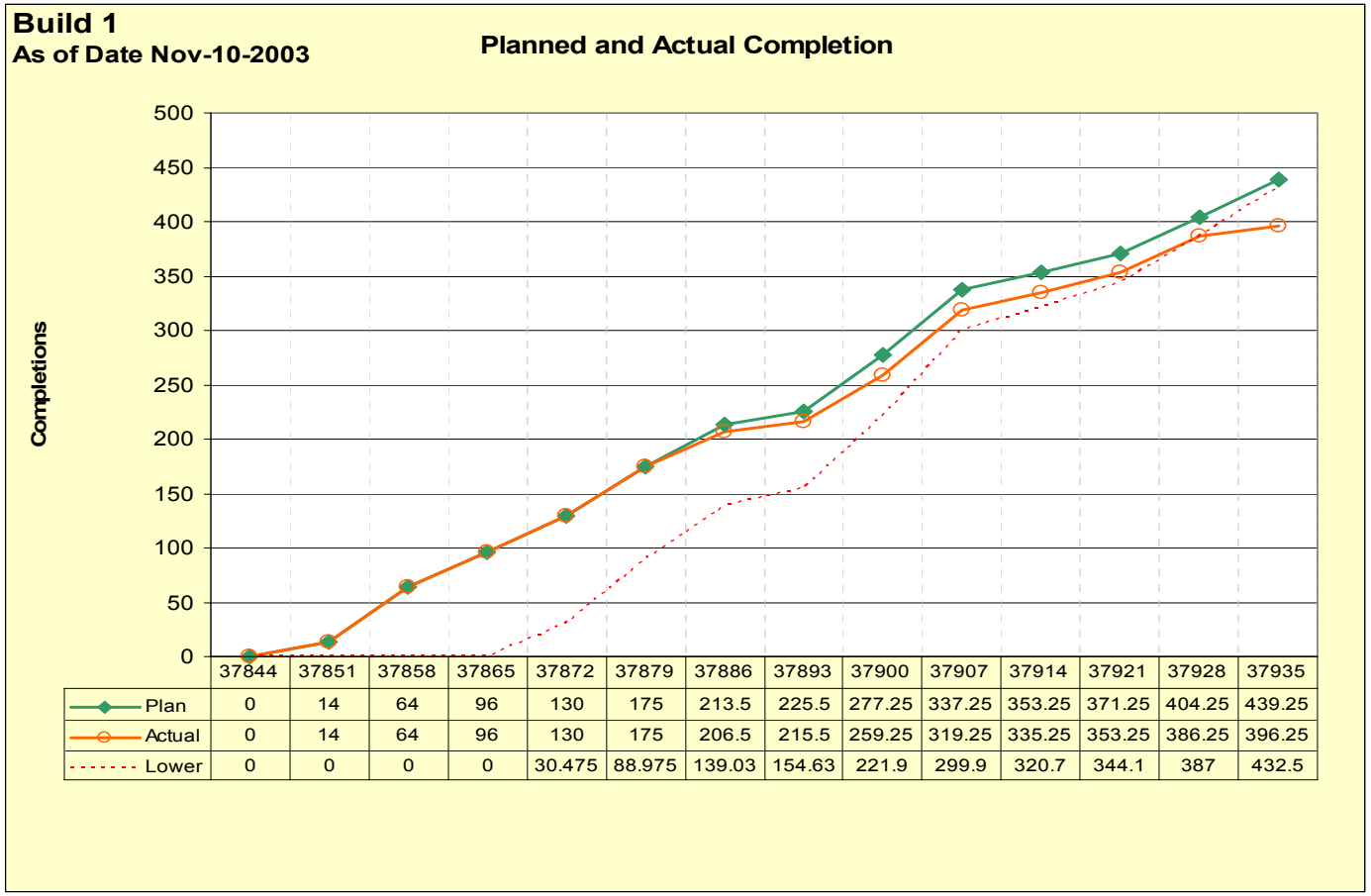
The table below shows all assets pertaining to Acquisition Planning that are currently listed in the PAL. The asset "owner" is the GSFC branch or organization responsible for developing and/or maintaining the asset. The status column shows the present state of the asset's development.

The table below shows all assets pertaining to this process...

Asset Number	Title	Owner	Asset Type	Status (More Info)	MS Office	PDF
4.2	ISD Acquisition Planning Process	580	Process	Outline		
4.2.1.1.1	Template for the S/W Portions of the CDRL List for an ABC Spacecraft or Instrument Acquisition	EPG	Template	Final		
4.2.1.1.2	Template for the S/W Portions of the CDRL DIDs for an ABC Spacecraft or Instrument Acquisition	EPG	Template	Final		
4.2.1.1.3	Template for the S/W Portions of a SOW for an ABC Spacecraft or Instrument Acquisition	EPG	Template	Final		
4.2.1.1.4	Template for the S/W Portions of a WBS for an ABC Spacecraft or Instrument Acquisition	EPG	Template	Final		

Available NOW
Progress Tracking Mentoring/Tool

At least one project from each Branch has received some mentoring in progress tracking and is using prototype spreadsheet



	37844	37851	37858	37865	37872	37879	37886	37893	37900	37907	37914	37921	37928	37935
Plan	0	14	64	96	130	175	213.5	225.5	277.25	337.25	353.25	371.25	404.25	439.25
Actual	0	14	64	96	130	175	206.5	215.5	259.25	319.25	335.25	353.25	386.25	396.25
Lower	0	0	0	0	30.475	88.975	139.03	154.63	221.9	299.9	320.7	344.1	387	432.5

Available NOW
Tool Information/Resources

- Progress Tracking Tool (Spreadsheets) + User information are on new Tool Page of website: http://software.gsfc.nasa.gov
  - Click on tool name for information and downloadable files
  - Look for "Point Counting Spreadsheets"
  - Mentoring is available by request

- Risk Management Tool is available for FSW
  - Tool will be generalized for other ISD use

- References on tool evaluations have been added
  - Look under "related tool links"
  - Information from INCOSE

SEARCH SITE

Tool title:	Point Counting Spreadsheets
Version:	V2.0g 09-30-04
Description:	These spreadsheets support the monitoring of workpackages that 1) have a moderate number of known tasks and 2) have task dependencies which are not a serious source of risk. The spreadsheets can display trend information to provide insight into progress including the ability to meet schedules. There are two spreadsheets in the downloadable ZIP file below: a Single Activity spreadsheet and a Multiple Activity spreadsheet. A User Guide is also provided.
System requirements:	MS Excel;MS Project (for optional features)
Disclaimer:	This is a beta test version; it will be refined to address user feedback.
Contact:	William J. Decker
Author:	William J. Decker
Tool ZIP file:	PointCounting.zip
OR Link to file:	User Guide

SEARCH NASA

Feedback on **this page**

Curator: Owen C. Kardatzke
NASA Official: Sara H. Godfrey
Last Updated: Tuesday, December 14, 2004

Available NOW-Information on NASA Directives, Standards

- Information on NASA NPR 7150.2 is available
  - Strategies for GSFC compliance are being developed
  - FAQ's are on NASA web site: http://software.nasa.gov
  - Examples of measurement assets are on NASA site

- Information on NASA Software Assurance Standard and NASA Software Safety Standard available through Code 300 (Sue Sekira)

"In the Works" Training Classes/Assets

- Training section on web site now includes
  - Lists of classes (available through SPI program)
  - Conferences section
  - Training links
  - On-line training
    - Includes JPL's *Quantitative Project Management*
    - Several CMMI presentations
- Planned FY05 classes:
  - *Software Project Management (1 week-at Wallops)*
  - *Software Inspections*
  - *Software Configuration Management*
- Currently giving *Software for Project Managers*

GSFC On-Line Training Program

The on-line courses and briefings shown on this page are available in one or more of the following formats: MS Office (PowerPoint); PDF (viewable with Adobe Reader), and HTML (web pages). To take an on-line course, click the icon for the format that is available or, if multiple icons are shown, for the format you prefer. Courses with a PowerPoint icon may be downloaded as well as viewed on-line.

Title/Description	Instructor	Status	MS Office Version	PDF Version	HTML Version
Quantitative Software Management	Jairus Hihn & Bill Decker	ON-LINE			HTML
This 2-day course trains software managers on the generation of software cost estimates and the use of software metrics in managing their software development activities. Cost estimation topics covered include software estimating methods and models; software development estimation, software development metrics, cost drivers, productivity, common errors in software estimation, rules of thumb, software productivity databases, and risk reduction and mitigation. The project measurement part of the class covers a variety of basic measures that are used to monitor software development including metrics for tracking growth and stability, resources and cost, schedule and progress, and quality. Additionally the class discusses how to analyze the measures, as well as how to plan for project/task monitoring.					
Using CMMI for Improvement at GSFC	Sally Godfrey	ON-LINE			
Systems Engineering Lecture given on June 1, 2004.					
What is CMMI?	Sally Godfrey	ON-LINE			
Brief overview of CMMI. PowerPoint presentation.					
CMMI Version 1.1 Tutorial	Mike Phillips	ON-LINE			HTML
Presentation by Mike Phillips, CMMI Program Manager, at the European SEPG Conference, April 2002. Revised February 2004.					
CMMI Today and Process Maturity Profile	Mike Phillips	ON-LINE			HTML
Presentation by Mike Phillips, SEI, Monday, Jan. 26, 2004.					

"In the Works" Lessons Learned

- Have a "Lessons Learned" Section on website
  - Are prototyping a lessons learned database to feed website
  - Want lessons accessible by multiple categories
- Have a few lessons under the role of "software manager" as prototype
- Want capability of search, submission, lessons feedback, questions and answers

"In the Works" Inspections/Peer Review Support

- Plan to re-offer inspections class
- Hope to have continued mentoring support in conducting peer reviews/inspections
- New start for FY05: support for analysis of peer review data (across multiple peer reviews)

Planned for FY05

- Metrics Support
  - Process, recommended metrics, repository, collection methodology
- General Information Sessions
  - Like “teas”: Informational topics to help your projects
- Mentors for projects working towards CMMI Level 2
- Improved key templates
  - Product plan template
  - Status Reporting template

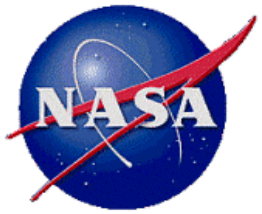
Summary

- Watch for e-mails that announce new assets
- Check the website periodically--it's constantly improving!

http://software.gsfc.nasa.gov

CMMI Goals:

Domain	FY04	FY05	FY06	FY07	FY08
Flight Software Branch		Level 2	Level 3		
ISD & Code 400 Mission Software			Level 2	Level 3	
Any Code 600/900 Mission Software not previously included				Level 2	Level 3



Back-up Slides

GSFC Software Process Improvement Plan

GSFC has a Software Process Improvement Plan, signed by Al Diaz, 9/01

Focus of Plan - **Improve the processes and practices in use at GSFC** using the Capability Maturity Model Integrated (CMMI) as a *measure* of progress

- GSFC Plan primarily addresses Strategy 1 in NASA Plan.
- FY04 Direction by Al Diaz: Achievement of specific CMMI goals

Domain	FY04	FY05	FY06	FY07	FY08
Flight Software Branch		Level 2	Level 3		
ISD & Code 400 Mission Software			Level 2	Level 3	
Any Code 600 /900 Mission Software not previously included				Level 2	Level 3

Scope of Plan - All projects defined by NPG 7120.5 (Mission Software) & identified by Center Director will participate in this initial effort

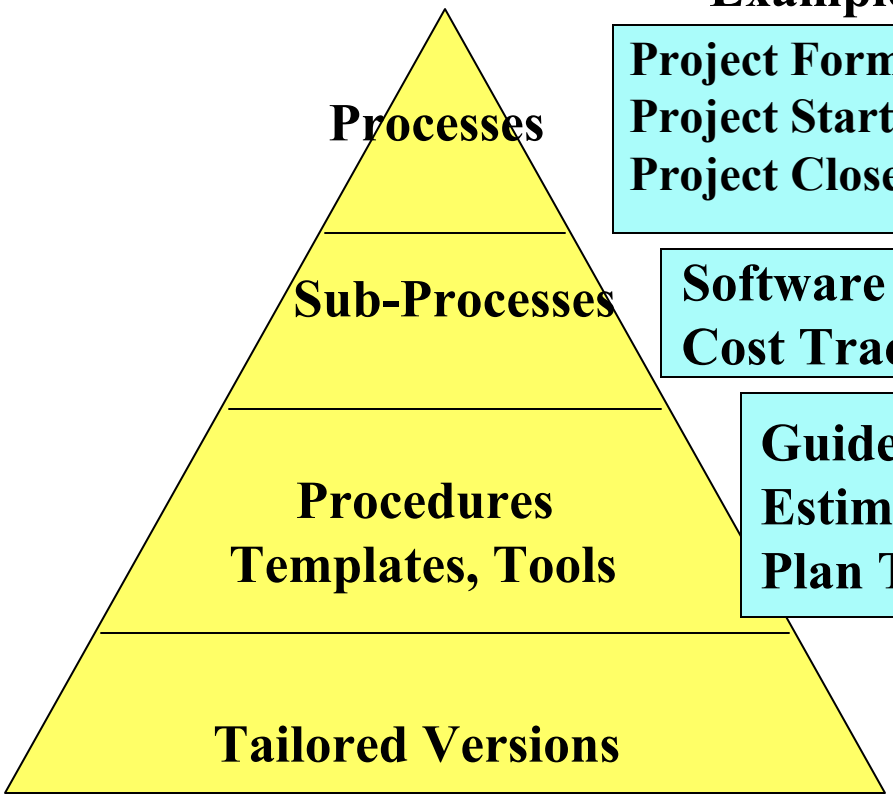
Overall Concepts- Documentation

- Will be a "generic" set of procedures/processes for ISD/GSFC
- "Generic set" will be tailored for Branches (FSW) or classes of software (e.g.-ground systems, science processing, research…) Must use Tailoring Guidelines.
- Projects can also tailor, based on tailoring guidelines
- ISD/GSFC documentation will be on EPG web site
  - Branch tailored documentation can be on Branch web sites
  - Web sites will include use-aids: checklists, templates
- Training and tools will be available with processes

Process Documentation Structure-Top-Down View

Documentation is divided into three Process categories: Project Management Processes, Product Development Processes, Organizational Support Processes

Examples from Project Management:



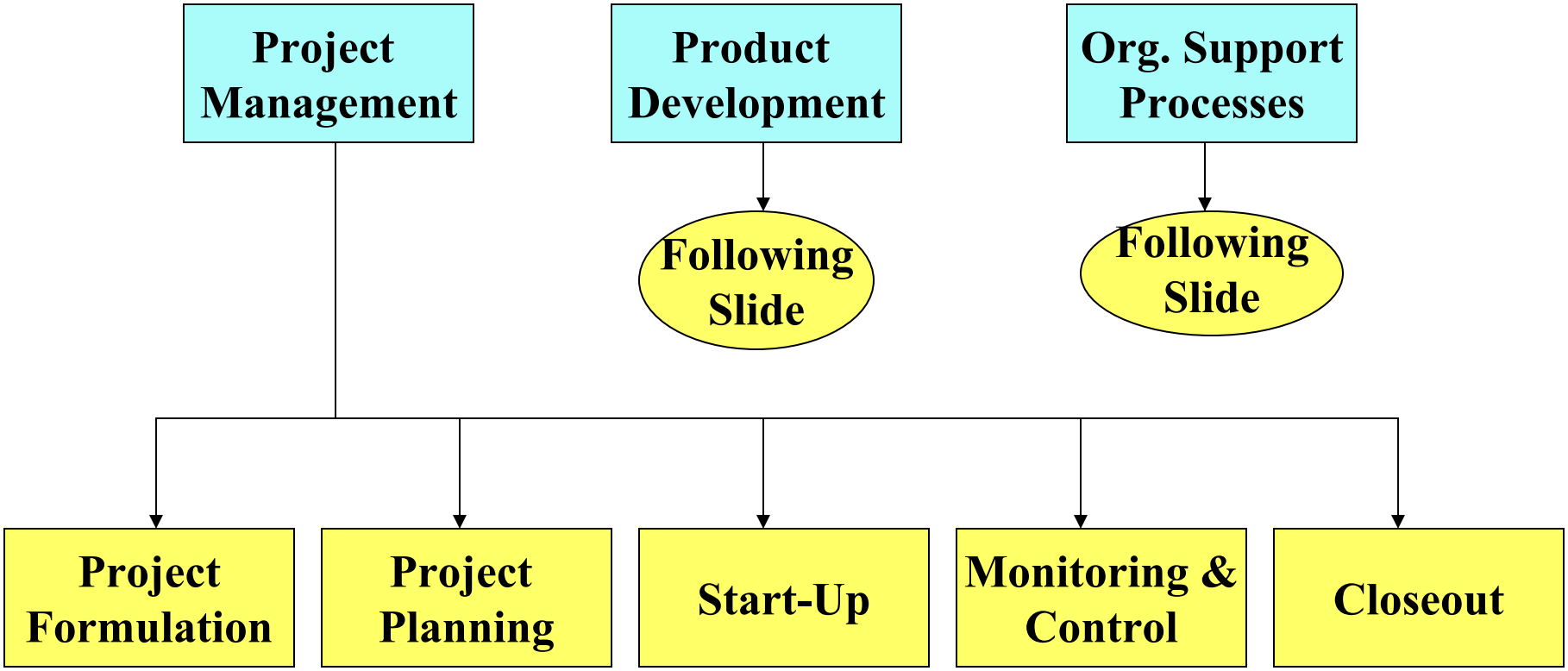
Project Formulation, Project Planning, Project Start-up, Project Monitoring & Control, Project Closeout

Software Estimation, Risk Management, Cost Tracking

Guidelines for selecting a life cycle, Software Estimates/Actuals Database, Risk Mgmt. Plan Template

FSW Standard Life Cycle, FSW Risk Management Procedure

Description of Processes to be Documented



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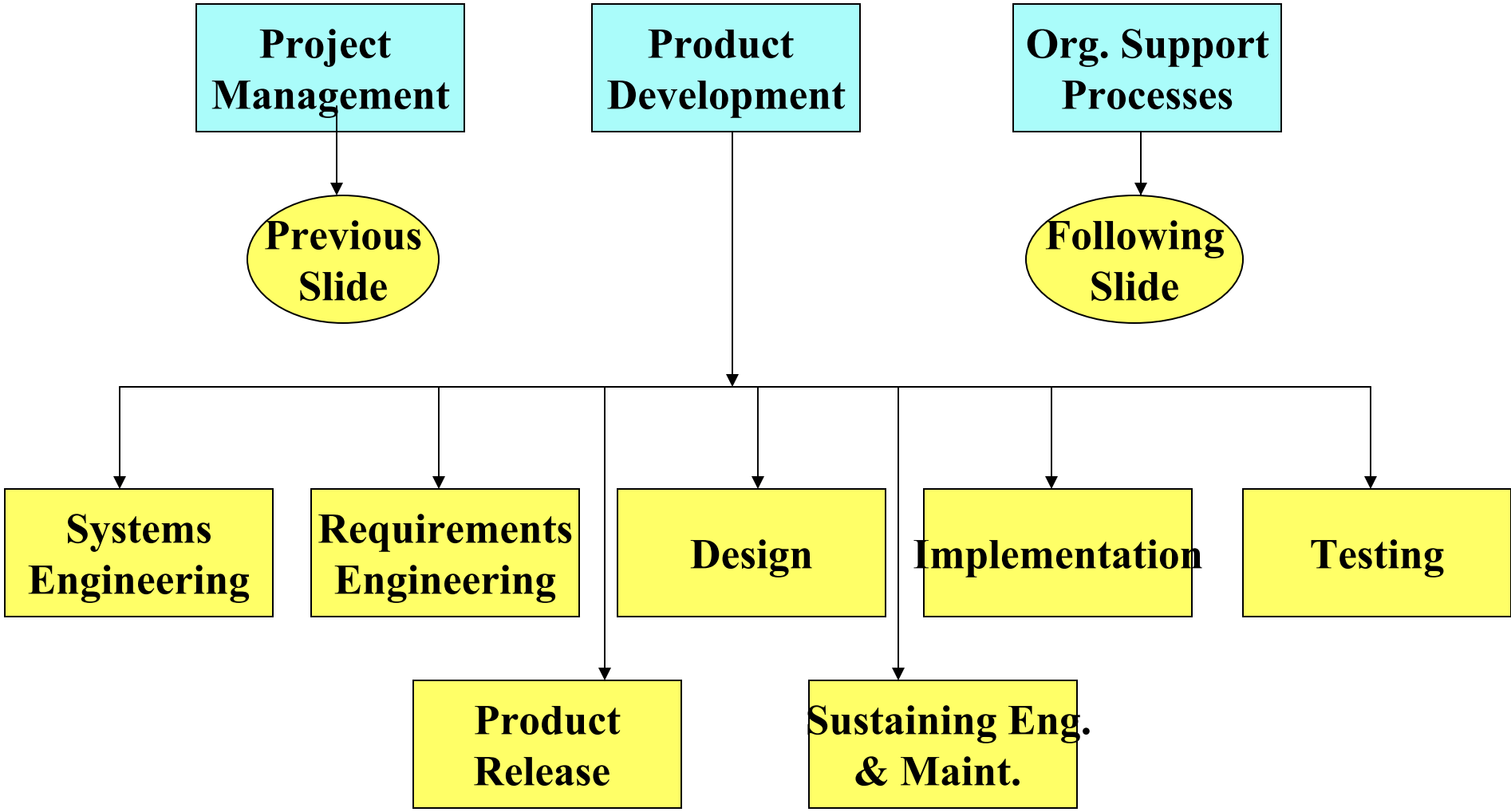

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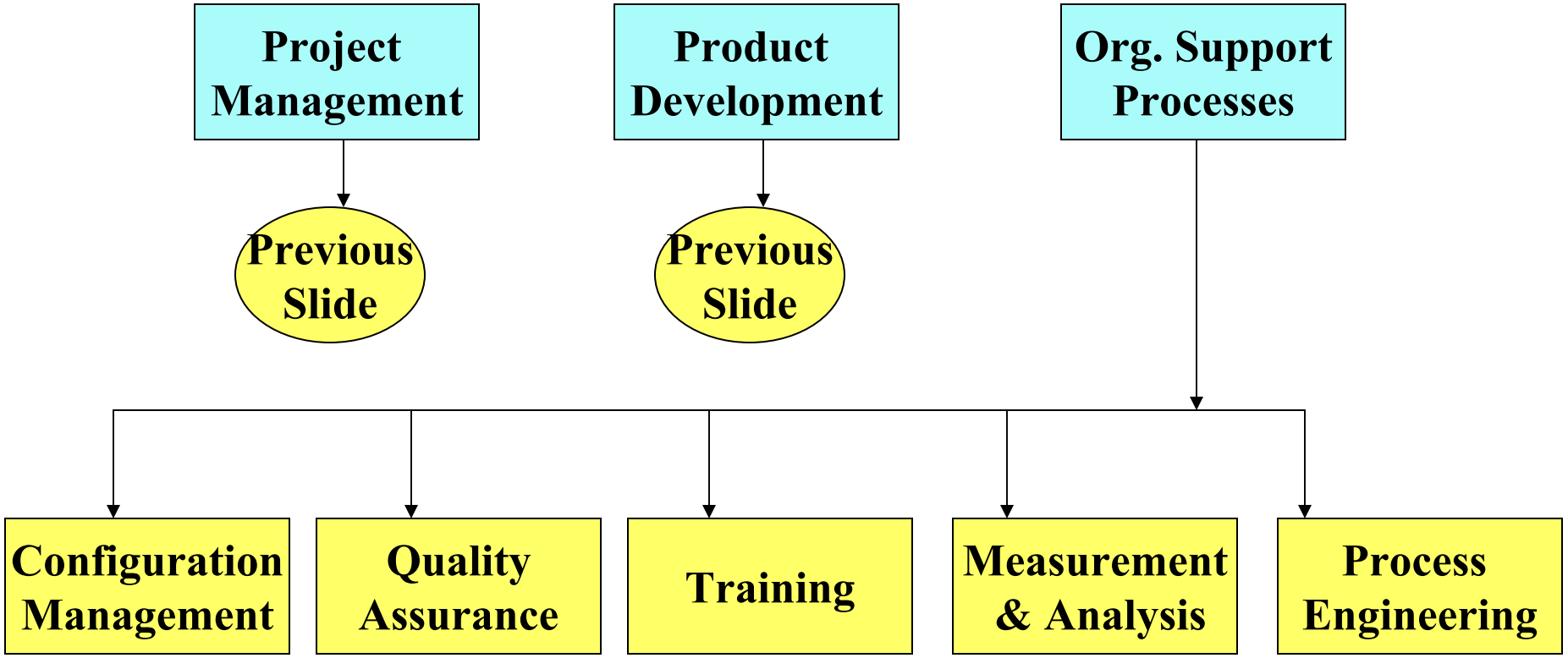

Process Asset Library

+About the PAL
+PAL Feedback Form
+PAL Help
+Glossary

PAL Contents

+Project Management
+Product Development
+Organizational Support

+PAL Index
+Assets by Role
+Assets by Tailoring
+Assets by Type

+Policies
+Standards

Welcome to the GSFC Process Assets Library

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PAL assets may be assessed in multiple ways. The following table shows how these access routes, or "views" can help you find the assets you need.

View	What the view provides
Contents	A table of contents for the PAL
Index	An alphabetical index into the PAL
Role	A list of the roles of personnel working on a typical software project, showing the process assets needed by each role and training courses for each role
Tailored	A set of process assets that have been created or "tailored for use on a specific project or in a specific domain
Description	High level descriptions of the 3 asset categories & the processes they contain
Asset Type	A set of all assets of the same type; e.g., all "templates" or all "checklists"

Software Training Associated with Process Improvement

Audience	Focus	Approach
Community/Others Interested	General Awareness	-Overview info on CMMI, improvement initiative -Lectures, teas, overview classes
Developers/Team Leads	ISD/GSFC specific practices	-Role-based approach -Train on documented procedures, guidelines, templates
Developers/Team Leads	Discipline expertise	-Focus on general skills -University classes, 3rd party classes, teas, conferences
Software Customers	Products, Software/ Customer Interface	-Emphasis on products delivered & needs for producing products -Use of products

What is CMMI?

The Capability Maturity Model Integrated (CMMI) is an **integrated framework for maturity models** and associated products that integrates the two key disciplines that are inseparable in a systems development activity: software engineering and systems engineering.

A **common-sense application** of process management and quality improvement concepts to product development, maintenance and acquisition

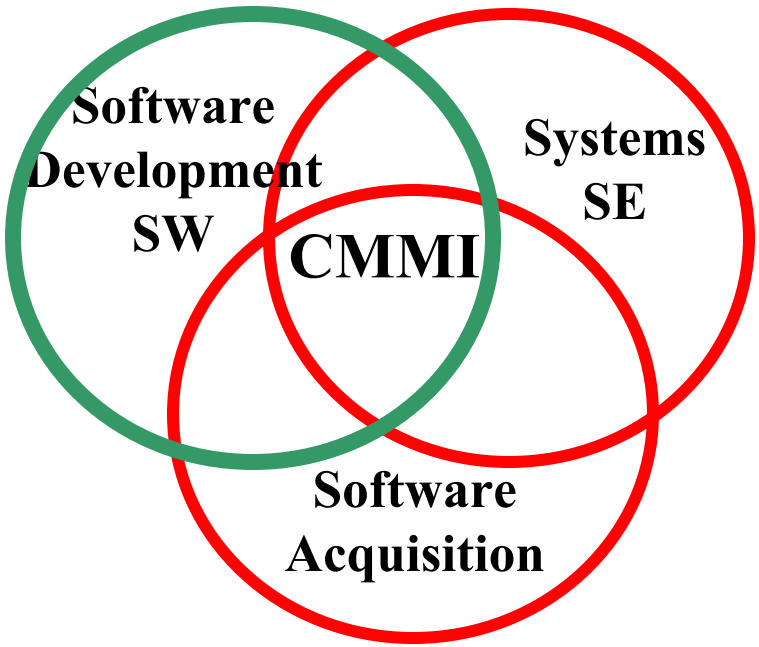
A set of **best practices**

A **community developed** guide

A **model for organizational improvement**

CMMI divides capabilities into 5 levels (5 highest)

GSFC Goal of achieving level 3 as beneficial



What is CMMI? What do levels of software engineering maturity mean?

Level	Description	Process Areas	Result
Optimizing 5	**Improvement institutionalized- routinely fed back into the process**	Causal Analysis & Resolution Organizational Innovation & Deployment	**High Productivity & Quality**
Quantitatively Managed 4	**Product and process are quantitatively controlled**	Organizational Process Performance Quantitative Project Management	
Defined 3	**Software engineering and management processes defined and integrated - processes standardized**	Organizational Process Focus Organization Process Definition Organizational Training Integrated Project Management Technical Solution/Product Integration Integrated Supplier Management Verification/ Validation Risk Management Decision Analysis Resolution	
Managed 2	**Basic project management in place; performance is repeatable**	Requirements Management Project Planning Project Monitoring and Control/ Supplier Agreement Management Process & Product Quality Assurance Configuration Management Measurement & Analysis	
Initial 1	**Ad Hoc**	Processes are informal and unpredictable	**High Risk**

Source: Software Engineering Institute